Bank Stability Measures in Dual Banking System: A Critical Review

Norzitah Abdul Karim[1], Amirul Afiff Muhamat[2], Azreen Roslan[3], Sharifah Faigah Syed Alwi[4] and Mohamad Nizam Jaafar[5]

[1,2,3] Faculty of Business and Management, Universiti Teknologi MARA, Kampus Puncak Alam, 42300 Selangor
[4, 5] Arshad Ayub Graduate Business School, Universiti Teknologi MARA Shah Alam, 43500 Selangor

norzitah@uitm.edu.my[1]

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Abstract

The 2007-2009 Global Financial Crisis showed that despite reported as 'healthy' financial institution prior to crisis had indeed suffered many problems including liquidity during the crisis. Thus, there is confusion on the healthy financial institutions, leading to loss of confidence on the overall stability of the banking system. Thus, there is an urgent need to review the current measures of financial as well as banking stability. This paper aims to look at the definition of 'stability' used in the academic researches and by different regulatory bodies, like International Monetary Fund, Basel Committee for Banking Supervision (BCBS) and central banks in selected countries with dual banking systems. It is then, critically review indicators used as measures of financial as well as banking stability. This review is hope to identify areas of strengths as well as weaknesses of the current measures of stability and serves as foundation for further research in future.

Keywords: financial stability, bank stability, measures, Basel, z-score

1 Introduction

The financial sector has undergo several crises and the recent 2007 crisis, known as 'Global Financial Crisis' (GFC) is considered the worst crisis in history. GFC has threaten the stability of banking sector and financial sector in general. The result of GFC was bank bailouts and worst the failure of several financial institutions like Lehman Brothers. There was loss of confidence and confusion as to what constitute a stable financial institution. The reported as seemed 'healthy' financial institution prior to the crisis, had indeed suffered failure during the crisis. There is also puzzle as to whether the Islamic banking is shielded from the crisis. Various survey of the literatures and news revealed that neither conventional banks nor Islamic banks were spared from financial crisis. For example, during the GFC, Federal deposit Insurance Corporation (FDIC) reported that in the United States of America, the percentage of failure banks was 26%. The GFC was also affecting Arcapita Bank BSC of US, which was formerly known as the First Islamic Investment Bank. In late 2009, the problem in Nakheel sukuk has triggered 'Dubai Debt Crisis'.

It is interesting to note that these crises happened despite the adoption of so-called state of the art regulation and methodologies. A focus on bank stability is thus motivated as a result of these crises happened despite banking sector are in fact heavily regulated. The issue of bank stability is thus motivated both from academic and a policy perspective. Financial and banking stability have been the centre of academic debate since the crisis with many researches focusing on the area.(Creel, Hubert, & Labondance, 2014; Swamy, 2014; Segoviano & Goodhart, 2009; Beck, Demirgüç-Kunt and Merrouche, 2010; Čihák and Hesse, 2010). Another reason of motivation is banking and financial stability is in its nature as a public good,

being non-rival good since the usage of its goods does not prevent other from accessing the same good and it is non-exclusivity good since the usage of the good does not deprive other from using it.(Creel et al., 2014).

Thus, the objective of this paper is to survey the bank stability measures critically, evaluating the effectiveness and weaknesses of the measures. It is noted that the current measure of stability of banks are through various measures such as previously Basel I, II and later Basel III introduced by Basel Committee on Banking Supervision (BCBS) of Bank for International Settlements, CAMELS ratio introduced by International Monetary Funds, various measures by individual central banks and academician's usage of z-score as a proxy of banking stability. Nevertheless, the finding of this review is that there is no internationally accepted framework and also uniformed measures of financial and banking stability adopted by banks around the world especially for financial system with different types of banks. Thus, this give rise to future research on the need of a measure of the bank stability especially for countries having both the Islamic and conventional banks in their financial system. The need to measure and compare between healthy and potential troubled banks could save the financial sector from experiencing another crisis.

The remaining of this paper is structured as follows. Section 2 discussed the methodology used in this paper. Section 3 discussed the definition of financial stability and banking stability, drawing the different between the two. Section 4 survey and critically analysed the banking stability measures based on principle-based and theoretical based measures. Lastly the conclusion is drawn in section 5.

2 Research Methodology

The method used in this paper is basically review of literatures to include journal articles and also selected countries' financial stability reports based on availability. The countries are selected based on the criteria of having both the Islamic and conventional banks in the financial system, or called 'dual banking' system. From the list of 18 countries with dual banking system, only 11 countries are selected in as the samples of the studies. The reason is these countries' total asset is above 0.5 percent of total global Islamic banking asset, according to Islamic Financial Services Board (IFSB). These 11 selected countries with dual banking countries and total asset is above 0.5 percent of the global Islamic banking asset, are Bahrain, Bangladesh, Egypt, Indonesia, Kuwait, Malaysia, Pakistan, Qatar, Saudi Arabia, Turkey and United Arab Emirates. It is also following Alam (2012) that the samples selected are these 11 countries.

3 Definition of banking and financial stability and its framework

Banking stability and financial stability have neither been properly defined nor agreed upon its definition among researchers or regulatory.(Segoviano & Goodhart, 2009; Gersl & Hermanek, 2010; Schinasi, 2004;Creel et al., 2014;Swamy, 2014). There is also no widely accepted on the measure, aggregate indicators and quantification that can be agreed as a measure of financial or banking stability or instability.(Segoviano & Goodhart, 2009;Gersl & Hermanek, 2010). According to Gersl & Hermanek, (2010), though if there is agreement on the definition of financial stability, the construction of indicators for aggregate financial stability is still at the infancy stage. In many research papers, the word financial stability and banking stability is used interchangeably. This is a result of absence of consensus and widely accepted model of financial stability Swamy (2014) as well as difficulty in measuring and defining financial

stability.(Schinasi, 2004;Creel et al., 2014;Swamy, 2014). Like what has been indicated by Allen & Wood (2006), it is paramount importance to define something with public policy objective because the right definition ensure the right policy been identified and implemented. Thus, it is important to define banking stability, financial stability and the different between the two, in light of this.

Before the financial and banking stability is defined, it is also useful to compare to other similar concept of stability, like price stability. Is definition of banking or financial stability the same as economic definition of price stability? Price stability is defined in economic as the price of general goods changes very slowly or does not changed at all, over time. Since, banking or financial stability would not tolerate on absence or slow incremental growth as growth is viewed as the most desired consequences of the industry. Thus, the understanding of this price stability is definitely not the understanding of stability of bank nor financial. So, what constitute the proper definition of bank stability? According to Gadanecz & Jayaram (2009), unlike price stability, financial stability is not easy to define or measure given the interdependence and the complex interactions of different elements of the financial system among themselves and with the real economy. This view of inter-relatedness of banking and financial stability is supported by Swamy (2014), and stresses on the importance on differentiating banking from financial stability. This inter-relatedness is also evidence in the definition by ECB (2007) that defines financial stability as a condition of financial system, which consists of banks, markets and market infrastructure, able to absorb the likelihood of financial shock, and mitigate the shocks in the banking processes.

Having said that the financial stability is very much related to banking stability as well as other components of financial system, a review of literatures revealed various definitions of financial stability. Nevertheless the themes on the definition are almost the same. The common themes on definition of financial stability are ability to absorb or withstand shocks (see, for example Schinasi, 2004;Allen & Wood, 2006;Petrovska & Mihajlovska, 2013;Houben, Kakes, & Schinasi, 2004;Popovska, 2014;ECB, 2013;Czech National Bank; National Bank of Belgium, 2014), financial solvency (Allen & Wood, 2006), liquidity (Allen & Wood, 2006) and free from financial distress (Segoviano & Goodhart, 2009). According to Schinasi (2004), financial stability is defined in term of bank's ability to "to facilitate and enhance economic processes, manage risks, and absorb shocks over time, along a continuum rather on over a static condition." Whereas, Houben et al. (2004) defines financial stability in terms of its ability to help the economic system allocate resources, manage risks, and absorb shocks, again over a continuum, changeable over time and consistent with multiple combinations of its constituent elements.

Most of the central banks of selected countries with dual banking system, defines financial stability in the context of withstanding the financial shocks. This is evident in their financial stability reports. The Central Bank of Kuwait defines financial stability as the resilience of the financial system to unanticipated adverse shocks. Similarly, the Central Bank of United Arab Emirates (UAE) defines financial stability as a state of financial system in steady state to perform its key functions and able to continue in the event of shocks.

In addition to this report of countries with dual banking, the theme for definition of financial stability by other central banks also reveal almost the same finding. Petrovska & Mihajlovska (2013) noted that the first Financial Stability Report for 2006 prepared by the National Bank of the Republic Macedonia, the financial stability is defined as the requirement for smooth operation of all segments of the financial system, with each of them providing the highest possible level of flexibility to absorb potential shocks. Other Central Bank like the ECB defines financial stability as a condition in which the financial system is capable of withstanding shocks, thereby reducing the likelihood of disruptions in the financial intermediation process, which are severe enough to significantly impair the allocation of

savings to profitable investment opportunities (ECB, 2013). Similarly, Central Bank like The Czech National Bank defines "financial stability as a situation where the financial system operates with no serious failures or undesirable impacts on the present and future development of the economy as a whole, while showing a high degree of resilience to shocks". According to Popovska (2014), Financial stability may be disturbed both by processes inside the financial sector leading to the emergence of weak spots, and by strong shocks. Such shocks may arise, among other things, from the external environment, domestic macroeconomic developments, and the position of the main debtors and creditors of financial institutions, economic policies or changes in the institutional environment.(Popovska, 2014). Other central bank like the National Bank of Belgium (2014) defines financial stability as trying to contain the build-up of systemic vulnerabilities over time and preventing as well as mitigating the structural systemic risks arising through vulnerabilities such as interlinkages between financial intermediaries, concentration of institutions' exposures and the critical role they play in key markets, which can render them too important to fail.

Nevertheless, other similar themes are also included in defining financial stability. According to Allen & Wood (2006), the definition of financial stability is more of taxonomic, classifying into different aspect of financial like financial solvency and liquidity. According Allen & Wood (2006) also defines financial stability as "a property of an economic system which is not prone to episodes of financial instability, dampening of perturbation, such as unexpected event, shock, unforeseen development or the unexpected failure, rather than amplifying it to larger in size and magnitude". In addition, the financial stability is defined and analysed by Segoviano & Goodhart (2009) from three different areas namely "common" distress in the banks of the system, distress between specific banks and distress in the system associated with a specific bank.

Having defining the financial stability, it is important to understand banking stability in view of financial stability, before the measures of banking or financial stability are analysed. According to Swamy (2014), the financial stability is a by-product of stability conditions prevailing in the banking system, financial markets and real economy, and he draws a paramount important of banking stability to the financial stability because at the micro level, the stability of banking system is dependent on asset capital adequacy, asset quality, earnings and liquidity of the individual banks. Moreover, according to Popovska (2014) the situation of the banking sector are typically considered as major determinants of the financial stability. This is also supported by Hartmann, Straetmans, & Vries (2005) that the important sector of the stability of financial system is the banking sector. Popovska (2014) further explained that the financial stability in the developed economies is mainly determined by the condition of non-banking financial institutions (investment funds, pension funds, private equity funds, brokerage houses etc.), unlike, in developing countries where stock exchanges, investment funds, pension funds and insurance companies are underdeveloped, and where investments rely on the traditional bank loans, banks are the main pillar of financial stability and overall stability of the economy.

4 Banking and financial stability measures

Having understand the important of definition of financial and banking stability, in this section, the measures of financial and banking stability are critically reviewed based on literature and regulatory practices. To simplify the discussion, the measures are divided into two namely principle-based measures and theoretically based measures. Basically, the principle-based measures are not supported by any theory but more of favourable measures adapted and/or

adopted by the regulator practitioners. While, as suggested by the name, the theoretical-based measures are supported and developed from a theory or principle in the area of finance.

4.1 Principle-based measures of bank stability

The principle-based measures looks at the measures provided by regulator practitioners such as International Monetary Fund, Basel Committee for Banking Supervision and Central Banks of countries with dual banking system. This will be discussed in the next section.

4.1.1 Financial Services Indicators by International Monetary Fund

Historically, according to Roman & Şargu (2013) and Christopoulos, Mylonakis, & Diktapanidis (2011), in 1979, the bank regulatory agencies used financial ratios based on CAMEL to assess the soundness of banks in USA. Later, these are extended and used as a tool to assess the soundness of banks for the supervisor authorities from different countries.(Roman & Şargu, 2013). International Monetary Fund (IMF) measures financial vulnerability and soundness, using handful indicators of Financial System Soundness with acronym CAMELS indicators signifies five major sections of a bank namely Capital adequacy, Asset quality, Management quality, Earnings ability and Liquidity.(Roman & Şargu, 2013) Nevertheless, it has been extended to include the sixth component "S", so that the CAMEL approach became the CAMELS approach, which to include the sensitivity of the bank to the changes in the market. (Roman & Şargu, 2013). This 'S' captures the sensitivity of market to include interest rate, foreign exchange and inflation risk which in overall capture the system risk.(Gasbarro, Sadguna, & Zumwalt, 2002). This CAMELS becomes the regulatory bodies monitoring instruments and also bank's evaluation of its performance.(Roman & Şargu, 2013). The IMF and the World Bank recommends the usage of CAMELS as the indicator for financial soundness of the banking sector, according to Roman & Şargu (2013) and measures of current health of financial institution.(IMF, 2000). Nevertheless, it is to note that many regulatory bodies do not disclose this CAMELS rating to public nor to the bank itself for the reason of avoiding systemic bank crisis.(Roman & Şargu, 2013). It should be noted that though these indicators are measure of the past problems, or backward looking, IMF (2000) acknowledge that these ratios have some impact on the current situations and thus useful indicators of the current health of the financial system.

The International Monetary Fund in 2000 produced a report entitled 'Macroprudential Indicators of Financial System Soundness' and indicated the importance of financial system soundness rather than the financial stability. However, the intention of the report is to produce indicators of financial soundness that contribute to a more stable and efficient financial system that is resilience to financial contagion in future. These indicators consisted of two main categories namely aggregated microprudential indicators and macroeconomic indicators or exogenous indicators. The aggregated microprudential indicators are also known with acronym CAMELS and market-based indicators. The macroeconomic indicators are economic growth, balance of payment, inflation, interest and exchange rate, lending and price boom, contagion effect and other factors. In the recent year, the IMF produces report called 'Global Financial Stability Report (GFSR)' twice a year, every April and October of every year. The following discusses the CAMELS indicators in brief.

The first indicator according to IMF (2000) is capital adequacy, which measure the robustness of financial institutions over the shocks to their balance sheets. If the ratios has a trend of declining over the years, then it may signal that there is an increased in risk exposure as well a possible capital adequacy problems. Bank capital is made of various elements which differ in term of availability and capability to absorb losses thus, IMF (2000) good indicators of bank's ability to withstand losses.

The second indicator is assets quality which tend to confirm the reliability of capital adequacy.(IMF, 2000). The asset quality indicator should reflect the current state of credit portfolio and credit risk associated with the asset.(IMF, 2000). The indicators should also include off-balance sheet for items like guarantees, contingent lending arrangements, derivatives, possibly, trust activities and operations of offshore banks, if there is deliberate credit risk effect on the portfolio of assets.(IMF, 2000). These indicators should include sectoral credit concentration, foreign currency denominated lending, non-performing loans, loan outstanding to loss making public sector entities, risk weighted asset to total asset and household indebtedness as these may signal area of vulnerability or exposure of the banks and also imply a higher credit risk.(IMF, 2000). The overall decreasing in trend for these indicators may signal a deterioration in the quality of credit portfolio, possibly affecting the cash flows, net income and solvency of the bank.

The third indicator is management soundness indicators, which measure the quality of management of the bank. The indicators for management soundness include expense ratios, earning per employee an expansion in the number of banks.(IMF, 2000). The expense ratio and earnings per employee indicate the operating efficiency of the banks, affecting the profitability, though may not necessarily due to management defect.(IMF, 2000).

The fourth indicator is earning and profitability. While declining trends in profitability signaling on risk of insolvency, abnormal high profitability is the sign of excessive risk taking.(IMF, 2000). The proxies for profitability are return on assets, return on equity and expense ratios.(IMF, 2000). The return on equity reflects the average return investors get from holding bank capital.(IMF, 2000). However, a high ratio may indicate both high profitability as well as low capitalization, and a low ratio can mean low profitability as well as high capitalization.(IMF, 2000). Thus, caution should be taken in interpretation of this ratio.

The fifth indicator is liquidity, which cover on the funding sources such as interbank, central bank credit and maturity mismatch. IMF view the macro level of liquidity in the financial system rather than at the banking level. According to IMF (2000), the high central bank credit to banks signify severe liquidity or solvency problem whereas high spread of interbank rates signal that the banks are risky.

The final indicator is sensitivity to market risk which involve some aspect of market risk due to diversification. In general, the market risk are interest rate, foreign exchange risk and prices of commodity.(IMF, 2000). High foreign borrowing could signify the high vulnerability and exposure to the changes in the exchange rate as well as interest rate risk in the foreign land.(IMF, 2000). The commodity price risk involve in the investment of commodity as the price of the commodity generally is more volatile than interest or exchange rate.(IMF, 2000).

4.1.2 BASEL by Basel Committee for Banking Supervision of Bank of International Settlements

The Basel Committee for Banking Supervision (BCBS) under Bank of International Settlements (BIS), was established in 1974, with the aim to close the gaps in international supervisory coverage in order to ensure all banks including foreign is properly supervised and the supervision is adequate and consistent across member jurisdictions. The aim of Basel is to have uniform and standardised regulation among member jurisdictions. The regulation, known as Basel Accord has no legal force and acts as a recommendation to the central banks of the member jurisdictions.

As at current, there are at least 3 Basel initiatives issued, as a mean to promote a more resilient banking sectors. This is basically with the intention to achieve the stability in banking system. The first Basel is known as Basel Accord or Basel I which was introduced in July 1988. It was introduced following the Latin America debt crisis that increase concern over the

capital ratio of international banks. It was recommended for members to maintain a minimum capital ratio at 8% by end of 1992. It was initially recommended for G10 countries but later extended to member jurisdiction with active international banks. In Nov 19991, there is amendment to the Basel I with the additional item of general loan-loss reserves to be included in the definition of capital adequacy ratio. In addition, the credit and market risk were introduced in the assessment in the later amendment. A careful evaluation of Basel I revealed that Basel I could be the cause of the 1997 Asian financial crisis.(Montgomery, 2005) investigated that the implementation of Basel I, increasing core regulatory capital from 4% to 8%, was rather strict and drastic for Japanese banks with international activities but lax on the banks with domestic activities only. This strict and drastic capital requirement caused Japanese banks to alter their portfolio, adjusting the various risk weight categories of assets to total and core regulatory capital, which basically causing them to review and pulling out risky assets from Asia countries.(Montgomery, 2005). It was noted that Japanese banks was the largest provider of investment and debt in Asia, with 60% of its total debt was in Asia while was the largest recipient of the debt.(Brana & Lahet, 2009). According to Brana & Lahet (2009), the implementation of Basel I caused the decrease in lending from the emerging country like Japan, that later caused a pro-cyclicity of credit crisis. In other word, as a result of the implementation of Basel Accord I, the Japanese experienced cyclical crisis that caused a contagion or systemic effect on Asian countries, on what is later known as the Asian financial crisis in 1997. (Montgomery, 2005;Brana & Lahet, 2009). As a conclusion on Basel Accord I, the implementation of capital requirement ratio was not only failed to reduce frequency of banking crises but caused the domestic credit crunch and stirred the financial crisis in the Asian countries, causing more economic slowdown.(Brana & Lahet, 2009). The other critique on Basel Accord I was that it only recognize credit risk exposure as the important element of risk equation (Panagopoulos & Vlamis, 2009) and ignoring other risks like market risk, operation risk and internal as well as external risk.

As a result of the discrepancy in the Basel Accord I, the BCBS issued an improved measure, in June 1999, called Basel II. It was supposed to improve regulatory capital requirements reflecting the underlying risks of the banking system. Basel II introduced 3 pillars which the first pillar is on the minimum capital adequacy, which include refining the calculation of regulatory capital into choices of 3 different methods of calculation. This include granular approach to credit risk weight, choice of method to calculate method of different risk types and incorporating operating risks into the calculation. The second pillar is on the supervisory review of capital adequacy, which include the supervisory to assess the risk profile to the required regulated capital ratio. The third pillar is on the disclosure requirement, which to banks are required to disclose their method of calculation of capital and the risk management process.

The main criticisms by (Goodhart, Hofmann, & Segoviano, 2004; Kashyap & Stein, 2004; Goodhart, Hofmann, & Segoviano, 2006;Gordy & Howells, 2006; Heid, 2007; Saurina, 2008), on Basel II even before the occurring of 2009 Global Financial Crisis (GFC) is on the pro-cyclicality inherent in the capital adequacy requirement and the regulatory system of Basel II itself and after 2009 GFC by (Terry, 2009) and (Andersen, 2011). According to Goodhart et al. (2004), the pro-cyclical effects of Basel II on economic activity that could amplify and prolong the macroeconomic fluctuations. This pro-cyclicality is due to method adopted is fair-value-accounting, point-in-time rating and advanced internal rating based (IRB) that are inherent in Basel II.(Goodhart et al., 2004). It is believed that the greater is the accuracy of current valuation, the greater is the resulting in pro-cyclicality of regulation.(Goodhart et al., 2004). Terry (2009) reiterated that regulatory capital under Basel II would be pro-cyclical as it will increase during the period of recession and decrease in the period of strong economic growth. Terry (2009) also criticised this Pillar I of Basel II where the capital adequacy is highly

correlated with risk exposure, and there is a concern that this lead to sudden downgrading in the capital adequacy in Australia, as it was historically been maintained at high ratio. In addition to pro-cyclicality, criticism by Panagopoulos & Vlamis (2009) highlighted that the regulated capital adequacy should be more risk-sensitive and include models of credit risk quantification and systems of internal credit risk rating. This is also supported by Terry (2009) where capital adequacy based on value at risk (VAR) is not adequate to reflect the credit risk. The second criticism is on the scope of Basel II. As Panagopoulos & Vlamis (2009) focus on real estate issue in banking, they noted that Basel II has limited coverage on real estate without mentioning of methods of valuation and has apply the same risk treatment though for different types of property companies with different underlying risk. The third criticism is on the Pillar II where the stress test should cover wider scope. Finally, the criticism on the disclosure requirement should include all securitisation and off-balance items in order to reflect the full view of the overall bank's total risks.

The Basel III was introduced in July 2009, with the aim to raise the resilience of banking system by strengthening and improving the consistency of the regulatory capital framework and improve disclosure requirement across jurisdictions, based on the foundation of three pillars of Basel II.(Basel Committee On Banking Supervision, 2010). The improvement was on the additional layer of common equity, countercyclical capital buffer, leverage buffer, liquidity requirements with later two modifications on the liquidity coverage ratio and net stable funding ratio. It is said that Basel III signifies the paramount important strengthening the capital rules underlying banking operations, aimed at preventing the severity of contagion crisis. (Rossignolo, Fethi, & Shaban, 2013)

Chalermchatvichien, Jumreornvong, & Jiraporn (2014) investigates the association among bank risk-taking, ownership concentration and Basel III. They found that higher ownership concentration promotes risk-taking. In addition to this, Dermine (2015) look at the Leverage Ratio and the impact of credit risk diversification on the probability of bad loan and insolvent banks. They found that the capital relief which induced by increase in diversification and lead to higher probability of bank run. Dermine (2015) also criticises that the risk weighted capital is too complex and complicated and this could lead to potential manipulation with optimization of risk-weighted assets. King (2013) investigates the trade-offs between liquidity regulation on the net stable funding ratio (NSFR), bank risk and profitability. They found that bank involve in riskier activities or liquidity creation. This actually lead to the criticism of Basel III where Basel III does not target market liquidity as it increases the cost of intermediation, change demand for asset with specific characteristics.

In term of implementation of Basel III in the selected countries with dual banking system, from 11 countries, only 5 countries, namely Kuwait, Malaysia, Qatar, Turkey and United Arab Emirates, mentioned the stage of adoption of Basel III in their Financial Stability Report. Basically, these 5 countries have started implementing as early in Jan 2014. However, the full implementation is still in progress for all these 5 countries. The details of the implementation is as below, in Table 1.

Table 1 Adoption stage of Basel for selected countries with dual banking system

Country	Adoption of Basel III	Sources
Kuwait	Since Dec 2014.	(Central Bank of Kuwait, 2014)
Malaysia	Starting and implementation from 1 June 2015.	(Central Bank of Malaysia, 2014)
Qatar	Since Jan 2014. Ongoing in stages.	(Qatar Central Bank, 2014)
Turkey	Implemented early 2015	(The Central Bank of the Republic of Turkey, 2015)
United Arab Emirates	Starting 2015.	(Central Bank of the U.A.E., 2014)

Sources: Author's own tabulation based on report.

4.1.3 Central banks of dual banking system

From a selection of 11 countries with dual banking system, the survey noted that only 7 countries namely Egypt, Indonesia, Kuwait, Malaysia, Qatar, Turkey and United Arab Emirates have produced Financial Stability Report/Review. The central banks of these countries produce the report on a systematic frequency of yearly basis, for most countries except Indonesia, producing it on twice yearly. The other 4 countries namely Bahrain, Bangladesh and Saudi Arabia does not have the report on website while Pakistan produces report in its own language, Urdu. The details of these reports and its frequency is tabulated in the Table 2, as below.

Table 2 Details of Financial Stability Report for countries with dual banking system

Country	Name of regulatory institution / Name of reviewed report	Frequency
Egypt	The Central Bank of Egypt / Financial Stability Review 2015	Yearly
Indonesia	Bank of Indonesia (central bank) / Financial Stability Review 2015	Twice yearly
Kuwait	Central Bank of Kuwait / Financial Stability Report 2014	Yearly
Malaysia	Central Bank of Malaysia / The Financial Stability and Payment System Report 2014	Yearly
Qatar	Qatar Central Bank / Financial Stability Review 2014	Yearly
Turkey	The Central Bank of the Republic of Turkey / Financial Stability Report 2015	Yearly
United Arab Emirates	Central Bank of the U.A.E. / Financial Stability Report 2014	Yearly

Sources: Author's own tabulation based on report.

From this Financial Stability Report/Review, it is noted that most of central banks monitor several indicators for key indicators like capital, assets, liability, liquidity, profitability and sensitivity to foreign exchange and interest rates of the overall banking system. However, the central banks of Kuwait, Malaysia and United Arab Emirates are monitoring key indicators like assets, financing, deposit and capital of Islamic banking. The information obtain from the reports is tabulated in the Table 3, as below.

Table 4 Survey of indicators used in Central Banks' Financial Stability Report

Indicators	CBE	BI	CBK	CBM	CBQ	CBRT	CBUAE	IMF
Banking System								
Capital	++	++	++	++	++	++	++	++
Assets	++	++	++	++	++	++	++	++
Liability		++	++	++	++	++	++	++
Liquidity	++	++	++	++	++	++	++	++
Profitability	++	++	++	++	++	++	++	++
Sensitivity to forex, interest rate		++				++		++
Islamic Banking System								
Assets			++	++			++	
Financing			++	++			++	
Deposits			++	++			++	
Capital			++	++			++	

Source: Author's own tabulation based on central banks' report

Note: ++ denotes the use of several indicators + denotes the use of one indicator

In specific, the Qatar Central Bank is measuring the banking stability from several perspectives using Soundness Index, Fragility Index, Profitability Index, Liquidity Index and Inefficiency Index.(Qatar Central Bank, 2014). In term of financial stability indicators, the

Qatar Central Bank are monitoring capital adequacy ratio, tier-1 capital/asset, non-performing loans/total loans, NPL/capital, return on average asset, net interest margin, cost income ratio, loan to deposit ratio, short term asset/short term liability, consumption loan/ private sector loans, real estate loan/ private sector loans. (Qatar Central Bank, 2014). On the other hand, the Central Bank of the Republic of Turkey is measuring financial stability from several perspectives like global economy, global markets, domestic economy, domestic markets, balance of payments, public sector, corporate sector, household sector and banking sector.(The Central Bank of the Republic of Turkey, 2015).

In addition to monitoring those important key indicators for both Islamic and conventional banks, some of these Central Banks also perform stress test to look at the impact of potential shocks to the specific areas. From the review of the Financial Stability Report, only Bank of Indonesia, Central Bank of Malaysia, Qatar Central Bank and Central Bank of the United Arab Emirates (U.A.E). The Bank of Indonesia used 2 types of stress tests namely scenario-based analysis and sensitivity analysis.(Bank Indonesia, 2015). The scenario-based analysis is performed at macro level to measure bank capital resilience against economic moderation. This is to look at the market risk in term of interest rate, exchange rates and SBN prices. (Bank Indonesia, 2015). The sensitivity analysis is performed on impact of increasing non-performing loans, that is, looking at the credit risk. (Bank Indonesia, 2015). The Central Bank of Malaysia applied almost similar stress tests, that is, broad scenario analyses, for spillovers and reversal of capital flows and sensitivity analyses, for loss estimation, severe correction, volatile in exchange rate and contagion risk from cross-boarder exposures.(Central Bank of Malaysia, 2014). In addition to this, Qatar Central Bank performed stress testing on credit risk, liquidity risk and market risk (interest rate).(Qatar Central Bank, 2014). Apart from this, Central Bank of the U.A.E. performed stress test based on 2 satellite models namely default rate satellite model (looking at the impact of a deteriorating economic environment on banks' financial risk and solvency) and probability satellite model (looking at eh economic scenario on banks' operating profit, before impairment charges.(Central Bank of the U.A.E., 2014)

4.2 Theoretical-based measure of bank stability

The theoretical-based measure is supported by a principle in finance called the Principle of Safety First. The principle and its development is discussed in the next section.

4.2.1 Empirical Evidence of Z-score as a proxy of measuring Bank Stability

The most popular measures of bank soundness and bank stability is z-score. According to Rajhi (2013) the z-score is a measure of the distance-to-default, which measures the market value of a bank's assets in relation to the book value of its liabilities. The z-score indicates the distance from insolvency combining accounting measures of profitability, leverage and volatility.(Rajhi, 2013). The z-score is inversely related to the probability of a bank's insolvency, i.e., the probability that the value of its assets will become lower than the value of the debt which means that higher z-score corresponds to a lower risk of insolvency.(Rajhi, 2013).

The theory of bank soundness or stability can be traced back as early as in 1952. It was developed by A.D. Roy based on a principle called as 'Safety First'. The principle of 'Safety First' was developed based on Roy's dissatisfaction over the simple rule of maximizing return and also his traumatic wartime experience.(Sullivan, 2011). The application of the principle of Safety First means that when having wide range of possible actions, including disasters, the gross return should not be less than some quantity.(Roy, 1952). In the application of Principle of Safety First, Roy (1952) identified variables 'm' representing the quantity and 'σ' representing the standard deviation of m, are the only quantities given the individual's knowledge of past. Roy (1952) identified there is a functional relationship between 'm' and

'σ', also calculate the probability of final return, using the calculation of 'upper bound' of this probability.

The z-score is popularized through an extending research on JH Boyd & Graham (1988) in their simulation of bank's mergers and the risk associated to it. (J. H. Boyd, Graham, & Hewitt, 1993). In this z-score measures the probability of bankruptcy of the simulated merger banks.(J. H. Boyd et al., 1993). Again, the previous work of Roy (1952) is not cited. This is also noticeable in the work by Liang & Savage (1990), where it is referred as G-ratio to measure the probability of failure using the same formula, but there is no mentioned of extending work of early scholars like (Roy, 1952) or (J. H. Boyd & Graham, 1986). Z-score also was used in another research by Boyd. (J. H. Boyd & Runkle, 1993).

The subsequent research by De Nicolo (2000) cited and referred to the earlier researches by Roy (1952) and Boyd. It is stated in the paper as an extension of the research carried out by Boyd in 1993.(De Nicolo, 2000). Nevertheless, z is only referred to the risk of insolvency.(De Nicolo, 2000). It is used to measure the insolvency risk in relation to the bank size, charters value and bank consolidation.(De Nicolo, 2000). The calculation is $z = (\mu + E/A)/ \sigma$, where K=E/A is the equity to asset ratio, $\mu = \pi/A$ is the return on asset and σ is the standard deviation of ROA. (De Nicolo, 2000).

Yeyati & Micco (2007) have cited all the previous works. Z-score and Z have been used interchangeable and used to calculate the probability of insolvency (as a proxy of banking stability) to the influence of competition, concentration and internationalization. (Yeyati & Micco, 2007). The calculation used is solvency risk which is the reverse of insolvency risk. This is represented by $1/z^2 = \sigma$ / ROA+ CAR, where ROA is the return on asset, σ is the standard deviation of ROA and CAR is the capital asset ratio.(Yeyati & Micco, 2007). This formula is similar to the previous studies. Yeyati & Micco (2007) founds that banking concentration did not decrease the competition but foreign penetration seems to head to a less competitive industry. Nevertheless, Yeyati & Micco (2007) revealed there is a positive relationship between banking sector stability and foreign penetration.

The modification and improvising of z-score is seen in the work by John Boyd, Nicolò, & Jalal (2006) when they introduced time-varying measure of z-score. The research used at least 2 types of time varying z-score. The first z is z-score is the moving mean and standard deviation of ROA calculated for each period and secondly, the z-score is the "instantaneous" standard deviation estimates calculated over the full sample combining with current period.(John Boyd et al., 2006).

From thereon, time-varying z-score is continued to be used. Cihák & Hesse (2007) used standard deviation estimates of ROA that are calculated over the full sample and combining these with current period. The work of Cihák & Hesse (2007) is more systematic with more variables like bank-specific variables, banking-industry specific variables, macroeconomic variables and also dummy variables (type of bank / market share of cooperative). The finding from this research is that cooperative banks have higher z-score than the commercial banks in the emerging market, suggesting the cooperative banks are more stable.

Demirgüç-Kunt, Detragiache, & Tressel (2008) used time-varying z-score to study the relationship of banking supervision and regulation, in particular Basel Core Principles, and bank soundness. Interestingly, z-score is a proxy calculation for bank soundness Demirgüç-Kunt et al., (2008), instead of bank solvency, as in the previous case. Demirgüç-Kunt et al., (2008) used more econometric model namely Probit and OLS model and used more variables like return of average equity, return of average asset, Net Loan to total Asset, Log Total Asset, ETA, LA, Indexes, GDP, Inflation and others. The finding suggests prioritization of banking supervision.(Demirgüç-Kunt et al., 2008)

Due to the recent global financial crisis, it has become a great interest and draw enormous attention to the bank insolvency risk Rahman (2010) thus the z-score has become paramount

important than ever.(Strobel, 2011). Rahman (2010) in her research noted that financing structures of the banks affect the risk exposure, bank's profitability, capital structure decisions, degree of risk tolerance and economic performance. According to Rahman (2010), there are 3 methods other than market-based-risk measures namely Z-score, CAPM risk measures and Zrisk index. Rahman (2010) in her research used Zrisk index with the rationale that it is most appropriate because Malaysian Islamic banks are relatively small and not publicly traded on the stock exchange. However, a careful look at the formula of Zrisk index will reveal that it is very much similar to Z-score. Rahman (2010) extending the work by Hannan & Hanweck (1988) where Zrisk risk is calculated as E(ROA) + CAP / σROA , where E(ROA) is the expected return on assets, CAP is the ratio of equity capital to total assets, and σROA is the standard deviation of ROA. The usage of zrisk as a measure of risk is also noted in the research by Ahmad, Ariff, & Skully (2008).

Lepetit, Nys, Rous, & Tarazi (2008) investigate the relationship between bank risk and product diversification in the bank. In measuring the bank risk, Lepetit et al. (2008) used 2 almost similar methods. The first method is a modification of the method by J. H. Boyd & Graham (1986) where it is known as ADZ or z-score and the ROE and the standard deviation of ROE is expressed in percentage. The formula is ADZ= (100+average ROE) / SD ROE. The second method is known as ADZP, and it is extension of n Goyeau and Tarazi (1992) where the formula is ADZP=ADZP1+ADZP2=[AROA/SDROA]+average ROE / SD ROA.

Strobel (2011) improved the measure of probability of insolvency, that is the z-score by identifying the downward biasness in using the (weighted) average of Z-scores thus a potential flaw measuring of systemic soundness. The downward bias was eliminated if the percentiles of bank-level Z-scores are weighted by total bank assets.(Strobel, 2011). Lepetit & Strobel (2013) makes a comparison of 5 different time-varying z-score, developed in the previous researches and suggest the best alternatives. The time-varying Z-score measures was further improvise using a simple root mean squared error criterion where it uses mean and standard deviation estimates of the return on assets calculated over full samples combined with current values of the capital-asset ratio, and is thus straightforward to implement.(Lepetit & Strobel, 2013). The advantages of this measure of time-varying z-score said to be more straightforward and does not drop initial observations. (Lepetit & Strobel, 2013)

Bourkhis & Nabi (2013) and Beck et al. (2013) used bank's soundness focusing on Z-score ratio as the indicator for bank's soundness. According to Bourkhis & Nabi (2013), Z-score ratio is an important measure for bank soundness because it is inversely related to the probability of bank's insolvency. Z-score is denoted as follows: $Z=(\mu+K)/\sigma$ where μ denotes the bank's average return on assets (ROA), K the equity capital in percentage of total assets and σ is the standard deviation of the ROA as a proxy for return volatility. (Bourkhis & Nabi, 2013). The probability of insolvency is defined as the probability that losses π exceed equity E i.e. Therefore, an increase of the Z-score is equivalent to a decrease of the upper bound of the insolvency risk. Under the assumption of bank's return normality, the Z-score can be interpreted as the number of standard deviations below the mean by which profits would have to fall in order to deplete equity. The bank's soundness is measured by Z-score that is the average return on asset plus equity divided assets divided by standard deviation of return on assets (Beck et al., 2013). Hsieh, Chen, & Lee (2013) used z-score, and called it z-index as one of the proxies for bank stability. The z-index is actually calculated manually by the author based on data from Bankscope, using the formual z-index=ROA+ E/TA / σ_{ROA} where, ROA is the ratio of return to total assets, E/TA is the equity percent of assets, and σROA is standard deviation of return on assets as a proxy for return volatility, using a 3-year moving average. (Hsieh et al., 2013). The bank-level Z-index means a larger value indicates higher stability and less overall bank risk (Hsieh et al., 2013).

5 Conclusions

As a conclusion from review of literatures and practice of regulators, it is noted that there is no standardised acceptable definition and framework of financial and banking stability. Nevertheless, few researches acknowledges that the financial stability is by-products of stability of other sectors in financial system, namely, banking system, equity, debt and other. In the academic researches, the researchers tends to use z-score as a measure of bank stability, which measures the distance from insolvency relative to volatility, profitability and leverage. This is due to simple and accurate measurement of bank stability. In linking banking stability in practice, a study of report produced by central banks of dual banking system reveals that only some central banks monitor the stability of Islamic banking while most focus on overall system, that is, conventional banks.

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